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First Atlantic Record of *Asthenomacrurus victoris* Sazonov & Shcherbachev (Macrouridae, Gadiformes, Teleostei)

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The rare abyssal benthic fish *Asthenomacrurus victoris* Sazonov and Shcherbachev, 1982 was previously known from only three type specimens captured on oceanic ridges of the Indian Ocean, one from off Japan, and two others from southeastern Australia. It is here reported for the first time in the North Atlantic from one specimen taken on the Mid-Atlantic Ridge at a depth of 3036 m during the 2004 MAR-ECHO Expedition. Additional specimens from southeastern Australia are also recorded, and the species is compared with its only congener, *A. fragilis* (Garman, 1899).

During the 2004 MAR-ECHO Expedition of the R/V *G. O. Sars*, a series of deep bottom-trawl stations were made on the Mid-Atlantic Ridge north of the Azores (Bergstad et al. 2008). At one station at a depth of 3036 m, a single somewhat-damaged specimen of what was initially identified onboard ship as *Sphagmacrurus hirundo* (Collett, 1897) was captured. On examination of the specimen during the MAR-ECHO Fish Taxonomy Workshop held at the Espegrend Marine Biological Station of the University of Bergen in February 2005, we erroneously determined that it represented an undescribed species of the genus *Kumba* Marshall, 1973, and it was reported as such by Bergstad et al. (in press). However, subsequent closer examination of the damaged vent area revealed that the anus was situated close before the anal fin and there was no sign of a ventral light organ—two features that precluded *Kumba* and suggested instead either *Asthenomacrurus* Sazonov and Shcherbachev, 1982 or *Macrosmia* Merrett, Sazonov, and Shcherbachev, 1983. The latter genus was eliminated because of the absence in the MAR-ECHO specimen of a greatly enlarged olfactory organ. Despite its damaged condition, most of the important diagnostic features remained intact to determine that it belonged to *A. victoris* Sazonov and Shcherbachev, 1982, a species known previously from only five specimens, two from the Indian Ocean, one from off Japan, and two from off southeastern Australia (Iwamoto and Graham 2001). Additional specimens of the species were examined by the first author during visits to Australian museums in 2003. It is the purpose of this paper to record these additional specimens and compare the species more closely with its only congener, *A. fragilis* (Garman, 1899) from the eastern central Pacific.

MATERIALS AND METHODS

Representatives of the genus were examined at AMS, CAS, CSIRO, MCZ, NMV, SIO, UMML, WAM, ZISP, ZMMGU, and ZMUB. The reader is referred to Eschmeyer (1998) for complete references for taxon names here cited as well as institutional abbreviations, which are more current than those of Leviton et al. (1985) and Leviton and Gibbs (1988). Methods for making

counts and measurements follow procedures outlined in Iwamoto and Sazonov (1988). Because of the fragile and weak head bones of these fishes, most specimens examined were damaged and in poor condition, making accurate measurements difficult and sometimes impossible. This was of particular concern with measurement of the snout length, a crucial component of the head length, which we use as the standard of comparison of other body and head parts. Since most of the Australian specimens were examined during hurried visits focused on a wide array of grenadier species, adequate time was usually not available to allow reconstruction of parts to get more accurate measurements. We feel, however, that enough measurements were taken to provide good characterization of the species. Counts and measurements of *A. fragilis* were taken during an earlier study (Iwamoto, 1979), in which seven specimens (including four type specimens) were examined. Collection information for those specimens is provided in that work.

Genus *Asthenomacrurus* Sazonov and Shcherbachev, 1982

Asthenomacrurus Sazonov and Shcherbachev, 1982: 2 (type species *Asthenomacrurus victoris* Sazonov and Shcherbachev, 1982, by original designation.)

DIAGNOSIS.—Branchiostegal rays 7. Anus and associated periproct region abutting anal fin origin. No apparent dermal window of light organ. Pelvic fin with 7–9 rays, fin origin under preopercle, far in advance of vertical through pectoral fin base; leading edge of spinous second ray of first dorsal fin weakly and sparsely serrated; pectoral fins placed relatively high on body, upper margin about on or near level with dorsal margin of opercle. Head bones weak and flexible; snout relatively high, its tip about on same horizontal as center of orbit; mouth large; upper jaw extending beyond vertical through posterior margin of orbit. Almost all of underside of head naked, including snout ventrally and along upper anterior margin. Scales small, usually covered with short, erect spinules in 1–3 parallel to slightly divergent crestlike rows. Pyloric caeca short, thick, 7–10.

REMARKS.—Sazonov and Shcherbachev (1982) described *Asthenomacrurus* to include their new species *A. victoris* from the central and eastern Indian Ocean and off Japan. They also included in their new genus *Macrurus fragilis* Garman, 1899, a poorly known species from the eastern tropical Pacific that, after its initial description in the catch-all genus *Macrurus*, was placed by Gilbert and Hubbs (1916) in their concept of *Lionurus* Günther, and later removed by Iwamoto (1979) to *Paracetonurus* Marshall, 1973. Sazonov and Shcherbachev (1982) and Merrett et al. (1983) discussed in depth the generic problems associated with these taxa. They considered *Asthenomacrurus* to be closest related to the monotypic *Macrosmia* Merrett, Sazonov and Shcherbachev, and less so to *Paracetonurus* and *Pseudonezumia* Okamura, 1970. The MAR-ECO specimen represents the first record of the genus from the Atlantic.

Asthenomacrurus victoris Sazonov and Shcherbachev, 1982

Figures 1–3

Asthenomacrurus victoris Sazonov and Shcherbachev, 1982:3–5 (Holotype and 2 paratypes; Indian Ocean and off Japan, Iwamoto and Graham, 2001:435 (2 specimens from off New South Wales, Australia, in 1642–1896 m).

DIAGNOSIS.—A species of *Asthenomacrurus* with head laterally compressed, much deeper than wide, interorbital space about (28)35–39% of HL. Snout high, preoral (or ventral) length 29–40% HL, acutely pointed in lateral profile, length about equal to or shorter than interorbital width. Chin barbel very slender, its length 11–17% HL, about equal to pupil diameter, slightly less

than least depth of suborbital region. Head pores not prominent. Pyloric caeca short, thick, 8–10 total. Pelvic finrays 7 or 8.

SPECIMENS EXAMINED.—ZMMGU P15349 (holotype: 37 mm HL, 249+ mm TL); Mid-Indian Ridge; 02°46'S, 65°41'E; 3530 m. ZMMGU P16012 (paratype: 42.5 HL, 225+ TL); Naturaliste Plateau, se. Indian Ocean; 33°42'S, 110°53'E, 2320–2350 m. ZIN 45000 (paratype: 39 HL, 223+ TL); off Honshu, Japan; 36°45'N, 142°46'E; 3460 m. ZMUB 6267 (38.1 HL, 230+ TL); Mid-Atlantic Ridge, 42°46'N, 29°16'W, 3036 m; RV G. O. Sars, Super St. 46, Local St. 372. NMV A7000 (42.8 HL, 215+ TL) and NMV A7001 (ca. 25.7 mm HL, 154 TL); off New South Wales, Australia; 34°42'S, 151°22'E; 1896–1642 m. CSIRO H5304–13 (42.9 HL, 200+ TL) and CSIRO H5304–38 (3 spec., 37–43 HL, 172+–190+ TL); off Victoria, Australia; 38°34'S, 149°28'E; 1979–1954 m. CSIRO H5313–05 (47 HL, 225+ TL); Tasmania, Australia; 39°48'S, 149°06'E; 1973–1946 m. AMS I.32446–001 (40 HL, 218+ TL); off Queensland, Australia; 11°35'49"S, 145°29'08"E; 1789–1876 m.

COUNTS (see also Table 1).—1D II,8 or 9; P i17-i21; V 7 or 8; gill-rakers total on first arch (outer/inner) 8–11 / 13–14, on second arch 11–14 / 11–13; scale rows below origin of second dorsal fin about 7.5.

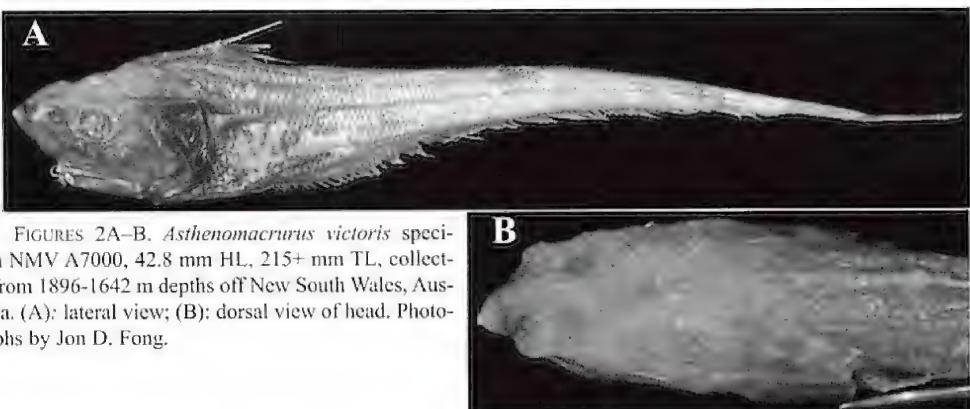
MEASUREMENTS (in percent of head length based on specimens examined and original description; see also Table 1).—Snout length 29–40%; preoral length 29–37%; internasal width 25–33%; interorbital width 28–39%; orbit diameter 22–30%; suborbital depth 15–21%; postorbital length 43–50%; distance orbit to angle of preopercle 41–49%; upper jaw length 36–42%; length barbel 11–17%; length outer gill slit 14–19%; preanal length 126–147%; greatest body depth 71–93%; height first dorsal fin 44–65% (2 spec.); length pectoral fin 47–72%; length outer pelvic ray 66–82%; interspace between first and second dorsal fins 21–37%.

TABLE 1. Comparison of selected measurements and counts of *Asthenomacrurus victoris*, *A. fragilis*, and MAR-ECO specimen ZMUB 6267.

	<i>Asthenomacrurus victoris</i>		<i>A. fragilis</i>	
	MAR-ECO spec.	current specimens	types	(original descr)
Measurements				
Total length (mm)	230	146+–225+	223+–249+	175+–200
Head length (mm)	28.1	25.7–47.0	37–42.5	26–35
	(in percent of head length)			
Snout length	29	31–40	30–32	26–35
Preoral length	29	29–36	29–37	—
Orbit diameter	26	22–27	22–30	22–23
Interorbital width	28	35–39	35–39	24–27
Postorbital length	49	43–50	45–47	—
Orbit to preopercle	42	41–49	42–44	33–44
Suborbital depth	18	16–21	15–18	—
Upper jaw length	39	36–42	38–41	31–39
Barbel length	15	11–15	13–17	19–24
Outer gill-slit length	19	14–19	18–19	17–20
Preanal length	136	126–147	139–141	—
Length V	72	66–82	69–71	—
1D–2D interspace	24	21–23	23–37	—
Body depth	79	73–93	71–77	66–69
Counts				
1D	II,9	II,8–9	II,8–9	II,6–9
P (incl. rudim. ray)	18–19	17–21	21–22	19–21
V	7–8	7–8	7–8	8–9
Gillrakers I (outer)	8	8–11	8–9	—
Gillrakers I (inner)	13	13–14	13–14	10–11
Gillrakers II (outer)	13	11–14	12–13	—
Gillrakers II (inner)	13	11–13	11–13	9–11
Pyloric caeca	9	—	8–10	10–15



FIGURE 1. *Asthenomacrurus victoris*, ZMUB 6267, 36.2 mm HL, 230+ mm TL, from 3036 m depth on Mid-Atlantic Ridge north of Azores. Photograph by Ingvar Byrkjedal.



FIGURES 2A–B. *Asthenomacrurus victoris* specimen NMV A7000, 42.8 mm HL, 215+ mm TL, collected from 1896–1642 m depths off New South Wales, Australia. (A): lateral view; (B): dorsal view of head. Photographs by Jon D. Fong.

DESCRIPTION OF MAR-ECO SPECIMEN (Fig. 1; comments on other specimens enclosed with parentheses).—Trunk relatively deep, tapering into a long slender tail; head length 6.0 (5–6 or more times) in total length. Head deep, compressed, its width about 1.5 into depth at hind margin of orbit; head bones relatively soft, pliable, weakly ossified; mucous chambers not greatly expanded. Snout pointed in lateral view, although median nasal rostrum very weak and easily bent to side, to give appearance of a blunt snout. Orbit round in outline, diameter less than width of broad interorbital or snout length. Suborbital region relatively flat and vertical (but possibly more rounded in life), dorsally scaly, naked ventrally below suborbital ridge, with some overlap of scales onto ventral surfaces. Preopercle large, broadly rounded posteroventrally, its posterior margin slightly (moderately) inclined from vertical, its ridge strongly developed. Interopercle narrowly exposed beyond preopercle margin along posterior and ventral margins. Opercle rather small, covering part of deep, slender subopercle. Mouth wide, upper jaws extend somewhat behind posterior margin of orbits; lips rather papillaceous. Chin barbel slender, tapering into a hairfine distal tip. Gill membranes narrowly connected across isthmus; gill openings wide, extending from upper margin of pectoral-fin base to under posterior margin of orbit.

First dorsal fin relatively small, fin rays weak and distal portions easily broken off; second spinous ray well developed and weakly serrated along leading edge (depressed ray extends posteriorly in one CSIRO specimen to about 10th dorsal ray). Second dorsal fin begins close behind first dorsal; its rays low and rudimentary over almost entire length. Anal fin relatively well developed to end of tail, its origin about below interspace of dorsal fins. Pectoral fin high, positioned above

mid-lateral line, the upper margin of fin base close to level of upper margin of opercle; the base well anterior to origin of first dorsal fin. Pelvic fins small, positioned far forward, anterior to pectoral fin, with its origin below posterior margin of orbit; outer ray relatively thick, tapering into a long thin filament (that extends to 5th to 16th anal ray).

Anus and urogenital pore within a small naked black periproct region immediately anterior to anal fin. (In specimens where abdominal wall broken or slit, the intestines relatively short, usually with only two or three folds.) Well-developed ovaries contained large oocytes, about 0.6–1.0 mm in diameter (including holotype and one other specimen).

Scales almost entirely missing on body (of most specimens); scattered few remaining on chest behind isthmus small with characteristic short, conical, erect spinules in 1–3 rows. Scales on head small, with one or few crest-like rows of short, conical spinules; most of ventral surfaces of head naked except for one small scale at posterior end of each mandibular ramus (also in one other specimen). A broad swath of small scales, each with a single row of short conical spinules below nasal fossa, the scaly swath continuing on dorsal surface of suborbital, with some overlapping ridge to underside; no modified, thickened scales on suborbital ridge and shelf. Broad ventral margins of preopercle and interopercle naked, but most of preopercle, opercle, and subopercle apparently scaly, based on presence of weakly defined scale pockets. One or two rows of cycloid scales on cleithrum beneath gill cover.

Jaw teeth all small, sharp, conical, in long tapered bands in premaxillary, three or four teeth wide at symphysis narrowing to two irregular rows posteriorly; dentary teeth in narrow band, about three rows wide anteriorly, tapering to one row posteriorly.

Color of fresh MAR-ECO specimen (from photograph; Fig. 1): ground color of tail and dorsal aspects of trunk dark brown. Abdomen black, with underlying skin violet (scale pockets prominently outlined in black); denuded surfaces of operculum, jaws, branchiostegal and gill membranes black; head dorsally grayish in denuded areas, medium brown over scaled area; first dorsal, pectoral, and pelvic fins black proximally, paler, somewhat brownish distally; anal fin blackish anteriorly becoming brownish to pale posteriorly over most of length. Color in alcohol (Figs. 2a–b) brownish to swarthy over most of dorsal aspects of trunk, becoming paler on tail; abdominal region blackish, with underlying bluish integument. Most of head blackish, including anterodorsal margin of snout, but colorless or whitish posterior to that margin on dorsal surface of snout posteriorly onto interorbital and nape. Lips, gill membranes, and inner lining of gill cavity blackish; mouth, gums, gill arches dark gray, barbel a lighter gray; gill filaments pale.

COMPARISONS.—Measurements and counts of the MAR-ECO specimen are compared with those of specimens from the Indian Ocean and western Pacific and with *A. fragilis* (Table I). The specimen agrees well in almost all characters with *A. victoris*. The only notable difference found was the decidedly narrower interorbital (28% vs. 35–39% HL). Despite the somewhat damaged condition of the MAR-ECO specimen, the interorbital space appeared relatively normal and intact, giving no reason to doubt the measurement made (or its identification as *A. victoris*).

Compared with *A. fragilis*, *A. victoris* has a somewhat larger orbit (22–30% vs. 22–23%), slightly broader interorbital ([28]35–39% vs. 24–27%), shorter barbel (11–17% vs. 19–24%), fewer average numbers of pectoral fin rays (16–20 vs. 19–21), more inner gill rakers (13–14 vs. 10–11 on first arch, 11–13 vs. 9–11 on second arch), and possibly fewer pyloric caeca (8–10 vs. 10–15).

REMARKS.—The presence of *A. victoris* in the North Atlantic came as somewhat of a surprise, considering how relatively extensively the region has been explored over the past century. However, if we consider the small number of successful bottom trawls made at 3000 m and deeper and that sampling at such depths on the Mid-Atlantic Ridge has been extremely limited, perhaps it

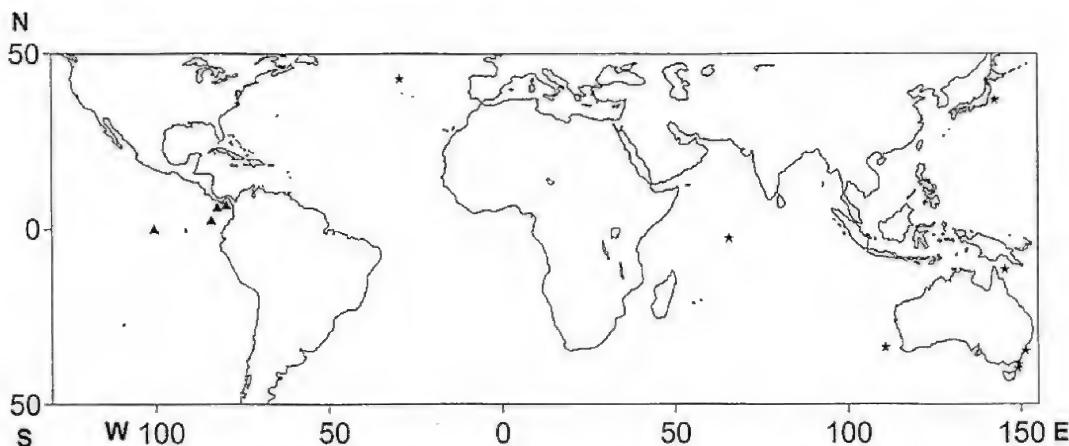


FIGURE 3. Known distributions of *Asthenomacrurus victoris* (stars) and *A. fragilis* (triangles).

could have been expected. The capture of a single specimen so distantly removed from its brethren in the Indian Ocean and western Pacific and its congener, *A. fragilis*, from the eastern central Pacific (see Fig. 3), echos the original discovery of other benthic macrourids of the lower continental slope and rise, for example, *Macrosmia phalacra* Merrett, Sazonov, and Shcherbachev, 1983, which was described from the northeastern Atlantic and the eastern Indian Ocean. That species has been subsequently recorded from the southwestern Pacific off Vanuatu (Merrett and Iwamoto 2000) and recently off Taiwan (Shao et al. [in press] 2008). Similarly, the genus *Paracetonurus* Marshall, 1973 (which is probably a synonym of *Pseudonezumia* Okamura, 1970) shows widely disjunct distributions of its two included species: *P. flagellicauda* Koefoed, 1927 from the Mid-Atlantic Ridge of the North Atlantic and the Madagascar Ridge in the southwestern Indian Ocean (Iwamoto and Orlov, 2006); and *P. occidentalis* (Iwamoto, 1979) from the eastern Pacific off Peru and California (Stein, 1985). We assume that most of these “rare” species are much more widely distributed than capture records show. It can be hoped that more exploratory trawling in the deep sea of the world oceans will add clarity to the distribution patterns of these species.

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